March 31, 2017

CERTIFIED MAIL # 7016 3010 0000 3688 3507
RETURN RECEIPT REQUESTED

TESORO

Tesoro Alaska Company
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907 776 5549 Fax

Director, Air Enforcement Division
Office of Civil Enforcement
U.S. Environmental Protection Agency
Mail Code 2242-A
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460-0001

Subject: United States of America v. Tesoro Refining & Marketing Company LLC, et. al. in the United States District Court, Western District of Texas, Civil No. SA-16-CV-00722

Consent Decree Initial Flare Management Plan (Initial FMP)

Dear Sir or Madam:

In accordance with Paragraph 127 of the Consent Decree referenced above, Tesoro Alaska Company LLC and Tesoro Logistics LP submit the enclosed Initial FMP for their facilities located in Kenai, AK.

Please contact Miles Jorgensen of my staff at miles.d.jorgensen@tsocorp.com or 907-776-3593 if questions arise pertaining to this report.

I certify under penalty of law that this information was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my directions and my inquiry of the person(s) who manage the system, or the person(s) directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Sincerely,

Cameron Hunt
Vice President, Kenai Refinery

Enclosure – Initial FMP

Cc: Director, Air Enforcement Division CERTIFIED MAIL #7016 3010 0000 3688 3514
Office of Civil Enforcement
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Ryan Soldat – SAT
Jessica O'Brien -- SAT
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Stoney Vining -- SAT

CD SharePoint site – Kenai > Semi-Annual Status Reports > General

Tesoro Alaska Company LLC

Kenai Refinery

Consent Decree Initial Flare Management Plan (Initial FMP)

April 1, 2017

Consent Decree Initial Flare Management Plan

April 1, 2017

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List of Acronyms

AGA	American Gas Association
ANSI	American National Standards Institute
API	American Petroleum Institute
CD	Consent Decree
CV	Control Valves
CDFMP	Consent Decree Flare Management Plan
CPMS	Continuous Parameter Monitoring System
DIB	Deisobutanizer Bottoms
EPA	United States Environmental Protection Agency
FGRS	Flare Gas Recovery System
FMP	Flare Management Plan
GC	Gas Chromatograph
GE	General Electric
HCK	Hydrocracker Unit
KO	Knock-Out
KPL	Kenai Pipeline
LPG	Liquefied Petroleum Gas
MOC	Management of Change
P&ID	Piping and Instrumentation Diagram
PFD	Process Flow Diagram
PHA	Process Hazard Analysis
PRIP	Partial Recycle Isomerization Process
PRV	Pressure Relief Valve
PSA	Pressure Swing Adsorption
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
SRU	Sulfur Recovery Unit
SSM	Startup, Shutdown, and Malfunction
SWS	Sour Water Stripper
Tesoro	Tesoro Alaska Company LLC

Definitions

Terms used in this Flare Management Plan and the Tesoro Consent Decree are defined within the Consent Decree Section IV. General Definitions as:

30-day rolling average shall mean the average daily emission rate or concentration during the preceding 30 Days that the unit(s) was operating.

Air-Assisted Flare shall mean a Flare at any Covered Refinery that utilizes forced air piped to a Flare tip to assist in combustion. Air-Assisted Flares subject to the terms of this Consent Decree are set forth in Appendix C - 2.1 of this Consent Decree.

Assist Air shall mean all air that intentionally is introduced prior to or at a Flare tip through nozzles or other hardware conveyance for the purposes including, but not limited to, protecting the design of the Flare tip, promoting turbulence for mixing or inducing air into the flame. Assist Air includes Premix Assist Air and Perimeter Assist Air. Assist Air does not include the surrounding ambient air.

Assist Steam shall mean all steam that intentionally is introduced prior to or at a Flare tip through nozzles or other hardware conveyance for the purposes including, but not limited to, protecting the design of the Flare tip, promoting turbulence for mixing or inducing air into the flame. Assist Steam includes, but is not necessarily limited to, Center Steam, Lower Steam, and Upper Steam.

Baseload Waste Gas Flow Rate shall mean, for a particular Covered Flare, the daily average flow rate, in scfd, to the Flare, excluding all flows during periods of Startup, Shutdown, and Malfunction. The flow rate data period that shall be used to determine Baseload Waste Gas Flow Rate for the Covered Flares is set forth in Paragraph 127.h.ii of the Consent Decree. The Baseload Waste Gas Flow Rate shall be identified in the Initial Flare Management Plan due under Paragraph 127 of the Consent Decree and may be updated in subsequent Flare Management Plans due under Paragraph 128 of the Consent Decree.

Block Average Period or **Block Period**, as it pertains to the Flaring Requirements in Section VI.B, shall have the meaning set forth in Appendix C - 1.15 of the Consent Decree.

Center Steam shall mean the portion of Assist Steam introduced into the stack of a Flare to reduce burnback. Diagrams illustrating the meaning and location of Center, Lower, and Upper Steam are set forth in Appendix C - 1.1 of the Consent Decree.

Combustion Zone shall mean the area of the Flare flame where the Combustion Zone Gas combines for combustion.

Combustion Zone Gas shall mean all gases and vapors found just after a Flare tip. This gas includes all Vent Gas, Total Steam, and Premix Assist Air.

Compressor shall mean with respect to a FGRS, a mechanical device designed and installed to recover gas from a Flare header. Types of FGRS compressors include reciprocating compressors, centrifugal compressors, liquid ring compressors, and liquid jet ejectors.

Consent Decree or **Decree** shall mean the Consent Decree (Civil Case No. SA-16-cv-00722) entered on September 28, 2016 in the United States Court for the Western District of Texas, including all appendices attached to the Consent Decree.

Covered Flare shall mean a Flare listed in Appendix C - 2.1 of the Consent Decree.

Covered Refineries shall mean the following facilities

Anacortes Refinery
10200 W March Point Rd.
Anacortes, WA 98221

Kapolei Refinery
91-325 Komohana St.
Kapolei, HI 96707

Kenai Refinery
54741 Tesoro Rd.
Kenai, AK 99611

Mandan Refinery
900 Old Red Trail NE
Mandan, ND 58554

Martinez Refinery including its Sulfuric Acid Plant
150 Solano Way
Martinez, CA 94553

Salt Lake City Refinery or "SLC Refinery"
474 West 900 North
Salt Lake City, UT 84103

Day or **Days** shall mean a calendar day or days.

EPA or **U.S. EPA** shall mean the United States Environmental Protection Agency and any successor departments or agencies of the United States.

Flare shall mean a combustion device lacking an enclosed combustion chamber that uses an uncontrolled volume of ambient air to burn gases. For the purposes of this Consent Decree, the definition of Flare includes, but is not necessarily limited to, Air-Assisted Flares, Steam-Assisted Flares, and non-assisted Flares.

Flare Gas Recovery System or **FGRS** shall mean a system of one or more Compressors, piping, and associated water seal, rupture disk, or similar device used to divert Potentially

Recoverable Gas from a Flare and direct Potentially Recoverable Gas to a Fuel Gas System, to a combustion device other than the Flare, or to a product, co-product, by product, or raw material recovery system or other system that avoids combustion of the gases.

Fuel Gas shall have the meaning set out in 40 C.F.R. § 60.101a.

Fuel Gas System shall mean the offsite and onsite piping and control system that gathers gaseous streams generated by refinery operations, may blend them with sources of gas, if available, and transports the blended gaseous fuel at suitable pressures for use as fuel in heaters, furnaces, boilers, incinerators, gas turbines, and other combustion devices located within or outside of the refinery. The fuel is piped directly to each individual combustion device, and the system typically operates at pressures over atmospheric. The gaseous streams can contain a mixture of methane, light hydrocarbons, hydrogen, and other miscellaneous species.

Initial Flare Management Plan or **Initial FMP** shall mean the document submitted pursuant to Paragraph 127 below.

Lower Steam shall mean the portion of Assist Steam piped to an exterior annular ring near the lower part of a Flare tip, which then flows through tubes to the Flare tip, and ultimately exits the tubes at the Flare tip. Diagrams illustrating the meaning and location of Center, Lower, and Upper Steam are set forth in Appendix C - 1.1 of the Consent Decree.

Minimum Total Steam Rate shall mean the Total Steam Mass Flow Rate, in standard cubic feet per minute or in pounds per hour, recommended by the manufacturer of the Flare's tip at the time of Flare tip installation, or such lower Total Steam Mass Flow Rate as determined by the Flare tip manufacturer after Flare tip installation upon re-examination of the tip's requirements.

Malfunction shall mean any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not Malfunctions. This definition does not apply to Section VI.B (Requirements for Control of Flaring Events).

Paragraph shall mean a portion of the Consent Decree identified by an Arabic numeral, including subparts thereof identified by lower case English letters, small Roman numerals, and all of the above listed indicators in parentheses.

Perimeter Assist Air shall mean the portion of Assist Air introduced at the perimeter of the Flare tip or above the Flare tip. Perimeter Assist Air includes air intentionally entrained in Lower and Upper Steam. Perimeter Assist Air includes all Assist Air except Premix Assist Air.

Pilot Gas shall mean gas introduced into a Flare tip that provides a flame to ignite the Vent Gas.

Potentially Recoverable Gas shall mean the Sweep Gas, Supplemental Gas introduced prior to a Covered Flare's water seal, and/or Waste Gas directed to a Covered Flare's FGRS or group of Covered Flares' FGRS. Purge Gas and Supplemental Gas introduced between a Covered Flare's water seal and a Covered Flare's tip is not Potentially Recoverable Gas. Hydrogen venting from the steam methane reformer (hydrogen plant) is not Potentially Recoverable Gas. Recycled hydrogen that bypasses the FGRS to reestablish hydrogen balance in the event that hydrogen demand declines or stops rapidly is also not Potentially Recoverable Gas. Excess Fuel Gas and excess gases generated during Shutdown, in turnaround, and during Startup, caused by a gas imbalance that cannot be consumed by Fuel Gas consumers in the refinery, because there is not sufficient demand for the gas, is not Potentially Recoverable Gas provided that when the excess gas is routed around the United States, et al. v. Tesoro, et al. (W.D. Tex) Consent Decree Page 17 FGRS, no natural gas is being supplied to the Fuel Gas mix drum. Nitrogen purges of Flaring Process Units that are being Shutdown, in turnaround and during Startup, or the nitrogen purging of operating Flaring Process Units during a partial refinery turnaround scenario, that cause the NHV of the Fuel Gas at the exit of the mix drum to fall below 740 BTU/scf, shall not be considered Potentially Recoverable Gas, and may be routed around the FGRS.

ppm shall mean parts per million.

Premix Assist Air shall mean the portion of Assist Air that is introduced to the Vent Gas, whether injected or induced, prior to the Flare tip. Premix Assist Air also includes any air intentionally entrained in Center Steam.

Prevention Measure shall mean an instrument, device, piece of equipment, system, process change, physical change to process equipment, procedure, or program to minimize or eliminate flaring.

psig shall mean pounds per square inch gauge, which is the difference between absolute pressure at the measurement point and atmospheric pressure.

Purge Gas shall mean the minimum amount of gas introduced between a Flare header's water seal and the Flare tip necessary to prevent freezing and oxygen infiltration (backflow) into the Flare. For a Flare with no water seal, the function of Purge Gas is performed by Sweep Gas and, therefore, by definition, such a Flare has no Purge Gas.

Rolling Average, as it pertains to the Flaring Requirements in Section VI.B, shall have the meaning set forth in Appendix C - 1.15 of the Consent Decree.

SCFD or **scfd** shall mean standard cubic feet per day.

Section shall mean a portion of this Consent Decree identified by a Roman numeral.

Shutdown shall mean the cessation of operation of equipment for any purpose.

Startup shall mean the setting into operation of equipment for any purpose.

Steam-Assisted Flare shall mean a Flare that utilizes steam piped to a Flare tip to assist in combustion. Steam-Assisted Flares subject to the terms of the Consent Decree are set forth in Appendix C - 2.1 of the Consent Decree.

Sulfur Recovery Unit or **SRU** shall mean a process unit that recovers sulfur from hydrogen sulfide by a vapor phase catalytic reaction of sulfur dioxide and hydrogen sulfide.

Supplemental Gas shall mean all gas introduced to the Flare in order to improve the combustible characteristics of Combustion Zone Gas.

Sweep Gas shall mean, for a Flare with a Flare Gas Recovery System, the minimum amount of gas necessary to maintain a constant flow of gas through the Flare header in order to prevent oxygen buildup, corrosion or freezing in the Flare tip or header; Sweep Gas in these Flares is introduced prior to and recovered by the Flare Gas Recovery System. Sweep Gas may be added to certain FGRS bypass lines that contain gas that is not Potentially Recoverable Gas. For a Flare without a Flare Gas Recovery System, Sweep Gas means the minimum amount of gas necessary to maintain a constant flow of gas through the Flare header in order to prevent oxygen buildup, corrosion or freezing in the Flare header or tip and to prevent oxygen infiltration (backflow) into the Flare tip.

Tesoro shall mean each of the following Tesoro entities: Tesoro Refining & Marketing Company LLC and Tesoro Alaska Company LLC, including their successors in interest and assigns.

Tesoro Refineries shall mean the Anacortes, Kenai, Mandan, Martinez, and Salt Lake City refineries listed above.

Total Steam or **S** shall mean the total of all steam that is supplied to a Flare and includes, but is not limited to, Lower Steam, Center Steam and Upper Steam.

Total Steam Mass Flow Rate or $\dot{m}_s$ shall mean the mass flow rate of Total Steam supplied to a Flare. Total Steam Mass Flow Rate shall be calculated as set forth in Equation 3 in Appendix C - 1.2 of the Consent Decree.

United States shall mean the United States of America, including the United States Department of Justice and the EPA.

Upper Steam, sometimes called Ring Steam, shall mean the portion of Assist Steam introduced via nozzles located on the exterior perimeter of the upper end of the Flare tip. Diagrams illustrating the meaning and location of Center, Lower, and Upper Steam are set forth in Appendix C - 1.1 of the Consent Decree.

Vent Gas shall mean all gas found just prior to the Flare tip. This gas includes all Waste Gas and that portion of Sweep Gas that is not recovered, Purge Gas and Supplemental Gas, but does not include Pilot Gas, Total Steam, or Assist Air.

For the purposes of calculating S/VG only, "Vent Gas Mass Flow Rate" or Qmass-rate shall mean the mass flow rate of Vent Gas directed to a Covered Flare. Vent Gas Mass Flow Rate shall be calculated as set forth in Equation 4 in Appendix C - 1.2 of this Consent Decree.

Waste Gas shall mean the mixture of all gases from facility operations at a Covered Refinery that is directed to a Flare for the purpose of disposing of the gas. Waste Gas does not include gas introduced to a Flare exclusively to make it operate safely and as intended; therefore, Waste Gas does not include Pilot Gas, Total Steam, Assist Air, or the minimum amount of Sweep Gas and Purge Gas that is necessary to perform the functions of Sweep Gas and Purge Gas. Waste Gas also does not include gas introduced to a Flare to comply with regulatory requirements; therefore, Waste Gas does not include Supplemental Gas. Waste Gas also does not include gases received from the Hawaii Gas synthetic natural gas plant downstream of the FGRS at the Kapolei Refinery. Depending upon the instrumentation that measures Waste Gas, certain compounds (hydrogen, nitrogen, oxygen, carbon dioxide, carbon monoxide, and/or water (steam)) that are directed to a Flare for the purpose of disposing of these compounds may be excluded from calculations relating to Waste Gas flow.

1.0 Introduction

1.1 Purpose

Tesoro Alaska Company LLC (Tesoro) operates the Kenai Refinery in Kenai, Alaska. The Kenai Refinery is a Covered Refinery in the Consent Decree, Civ. No. SA-16-cv-00722, between the United States of America, the State of Alaska, the State of Hawaii, and the Northwest Clean Air Agency and Tesoro Refining & Marketing Company LLC, Tesoro Alaska Company LLC, Tesoro Logistics L.P., and Par Hawaii Refining LLC (herein referred to as the Consent Decree).

One of the affirmative relief provisions in Section V of the Consent Decree (CD) requires that a Flare Management Plan (FMP) be developed and submitted to the United States Environmental Protection Agency (EPA) and Applicable State Co-Plaintiff by each of the Covered Refineries. This Initial FMP fulfills the Paragraph 127 CD requirements. For the Covered Flare at the Kenai Refinery this FMP:

- Lists the process units and equipment connected to the Flare (Paragraph 127.a)
- Assesses if discharges to the Flare can be minimized or prevented (Paragraph 127.b)
- Describes the Flare and associated process equipment (Paragraph 127.c)
- Maps the Waste Gas, purges, and sweeps of the Covered Flare(s) (Paragraph 127.d and 127.h)
- Documents the Waste Gas composition, quantifies flow, and provides monitor specifications (Paragraph 127.e)
- Describes each pressure relief valve vented to the Flare (Paragraph 127.f)
- Presents minimization efforts to reduce flaring during Startup and Shutdown (Paragraph 127.g)
- Documents any plans to take Covered Flares out of service (Paragraph 127.i)
- Describes flaring Prevention Measures (Paragraph 127.j)

The history of and revisions to this FMP are described in Appendix A. Flare connections and drawings are provided in Appendix B. Appendix C provides a cross-reference table listing where each requirement of Paragraph 127 is addressed in this FMP. Pursuant to Paragraph 128, this FMP will be updated annually hereafter by April 1 of each subsequent year until the CD is terminated.

1.2 Facility Description

Tesoro operates the Kenai Refinery in Kenai, Alaska. The Kenai Refinery has a crude oil processing capacity of approximately 72,000 barrels per day and is located in an industrial area approximately 10 miles north of the city of Kenai, Alaska. The stationary source consists of a number of petroleum refinery process units and associated process heaters and storage tanks, a Sulfur Recovery Unit (SRU), a cogeneration facility, and an underground pipeline system that extends from the refinery to the Kenai Pipeline (KPL) facility and the Anchorage and Nikiski Terminals.

1.3 Affected Flares

The Kenai Refinery operates two Flares: the Main Refinery Flare (J-801) and the SRU Flare. Only the Main Refinery Flare is a Covered Flare under the CD. Therefore, this FMP only addresses the Main Refinery Flare. The Main Refinery Flare's detailed specifications are included in Section 2.0 of this plan.

1.4 Summary of Flare Performance

The primary historical causes of flaring at the Kenai Refinery are full refinery turnarounds, external power outages, earthquakes, and Fuel Gas imbalances. An analysis of past flaring events was conducted to determine the most effective means of minimizing or preventing flaring. To reduce the Baseload Waste Gas Flow Rate to the Main Refinery Flare, the Kenai Refinery has evaluated minimization efforts and Prevention Measures in accordance with Paragraph 127.g and Paragraph 127.j.

Flare minimization at the Kenai Refinery has been an ongoing effort. Flaring minimization efforts have been evaluated based on feasibility, secondary environmental impacts and safety considerations. Procedures to minimize or eliminate discharge to the Main Refinery Flare during planned Startup and Shutdown events are described in Section 7.0.

Flare Prevention Measures were evaluated on a Refinery-wide and on a unit-specific basis. The Flare Prevention Measures at the Kenai Refinery address planned maintenance activities such as Startup and Shutdown of Flaring Process Units, gas quality and quantity, and recurrent failure of air pollution control equipment, process equipment, or process upsets. A full description and evaluation for all Prevention Measures that have or will be implemented at the Kenai Refinery are described in Section 6.0.

2.0 Flare Specifications

2.1 Required Flare Information

CD Paragraph 127.c requires the Flare specifications included in Table 2-1, as well as the simple process flow diagram (PFD) included in Appendix B.

2.1.1 Main Refinery Flare

Table 2-1 Main Refinery Flare Information Requirements

Flare	Main Refinery Flare	Reference
127.c Information Requirements		
Ground or elevated	Elevated	127.c.i
Flare height	200 feet above grade	127.c.i
Type of assist system	Air	127.c.i
Routine or Startup/Shutdown /emergency only	Routine	127.c.i
Equipped with Flare Gas Recovery System (FGRS)	Yes	127.c.i
Smokeless capacity based on design conditions	11,500 lb/hr	127.c.ii
Maximum Vent Gas flow rate	344,000 lb/hr	127.c.iii
Maximum Supplemental Gas flow rate	200 mscfd	127.c.iv
Minimum Total Steam Rate	Not Applicable - Air-Assisted Flare	127.c.v
Maximum Total Steam Rate	Not Applicable - Air-Assisted Flare	127.c.v
Assist Air blower single speed, multi-fixed speed, or variable speed	Variable speed	127.c.vi
Air flow versus fan speed setting or fan curve; for fans/blowers with fixed speeds, provide the estimated Assist Air flow rate at each fixed speed. For variable speeds, provide the design fan curve (e.g., air flow rate as a function of power input).	The fan curve is included in Appendix D	127.c.vi
Simple Process Flow Diagram (PFD) showing Flare tip, knock-out (KO) pots, Flare headers, subheaders, assist system, and ignition system	See Appendix B	127.c.vii
Flare tip date installed	2006	127.c.vii
Flare tip manufacturer	John Zink	127.c.vii

Flare	Main Refinery Flare	Reference
Flare tip nominal diameter	34"	127.c.vii
Flare tip effective diameter	26"	127.c.vii
Flare tip drawing	Confidential – Available onsite	127.c.vii
KO pot(s) dimensions	D-804: 8’-0” DIA. X 18’-0” T/T Boot 18” X 2’ 0” T/T	127.c.vii
KO pot(s) design capacity	D-804: 50 psig @ 460°F	127.c.vii
127.d Information Requirements		
Description and simple PFD showing all gas lines (including Waste Gas, Purge Gas or Sweep Gas, Supplemental Gas) associated with the Covered Flare.	See Appendix B	127.d
Purge Gas type	Natural gas	127.d
Sweep Gas type	Natural gas	127.d
Supplemental Gas type	Natural gas	127.d
Designate which lines are exempt from composition or NHV monitoring and why	See Appendix B	127.d
Designate which lines are monitored and indicate location and type of each monitor	See Appendix B	127.d
Designate pressure relief devices vented to the Flare	See Appendix B	127.d

2.1.1.1 Main Refinery Flare Monitoring

In accordance with the requirements of Paragraph 117, the Kenai Refinery has installed an ultrasonic flow monitor with temperature and pressure correction at a location downstream of the water seal as shown in Appendix B. The flow meter was installed in September 2016, prior to the required installation date of April 1, 2017. The flare flow monitoring details, required by Paragraph 127.e, are included below. The ultrasonic flow monitor meets the performance requirements of CD Appendix C-1.10 Section I. Perimeter Assist Air flow is determined by continuous fan speed monitoring and the fan’s curve as permitted by Paragraph 117. The Main Refinery Flare does not have Premix Assist Air.

Table 2-2 Main Refinery Flare Flow Meter Information Requirements

Vent Gas Flow Meter	CD Specification Requirements	Reference	Design Specifications
Type	None	127.e	Ultrasonic Flow Meter
Make	None	127.e	General Electric (GE)
Model	None	127.e	Panametrics Dual-Path 868-1-1-20014-FM-0-0; four transducers model number T5S-18-10-22.0-NT-TI-0-0
Precision	None	127.e	±1% at 0.5 to 275 fps
Velocity range	0.1–250 fps	CD Appendix 1.10	0.1-275 fps
Repeatability	± 10% of reading over the velocity range 0.1 to 1.0 fps ± 1% of reading over the velocity range >1.0 to 250 fps	CD Appendix 1.10	Per the manufacturer, the flow meter meets this requirement.
Design accuracy	± 5% initially to 40%, 60%, 90% of monitor full scale as certified by the manufacturer	127.e CD Appendix 1.10	± 2% to 5% of flare flow between 1 fps to 275 fps
Operational accuracy	± 20% of flow rate at velocities ranging from 0.1 to 1 fps ± 5% of flow rate at velocities greater than 0.3 m/s	CD Appendix 1.10	Per the manufacturer, the flow meter meets this requirement.
Installation	Applicable American Gas Association (AGA), American National Standards Institute (ANSI), American Petroleum Institute (API), or equivalent standard	CD Appendix 1.10	The Refinery Flare flow meter has been installed according to AGA, ANSI, API or an equivalent standard.
Flow rate determination	Corrected to one atmosphere pressure and 68°F	CD Appendix 1.10	Corrected to 1 atm and 68°F

Vent Gas Flow Meter	CD Specification Requirements	Reference	Design Specifications
Quality Assurance/Quality Control (QA/QC)	Conduct a flow sensor calibration check at least biennially (every two years); conduct a calibration check following any period of more than 24 hours throughout which the flow rate exceeded the manufacturer's specified maximum rated flow rate or install a new flow sensor. At least quarterly, inspect all components for leakage, unless the meter has a redundant flow sensor. Record the results of each calibration check and inspection. Locate the flow sensor(s) and other necessary equipment (such as straightening vanes) in a position that provides representative flow; reduce swirling flow or abnormal velocity distributions due to upstream and downstream disturbances.	127.e CD Appendix 1.10	The Kenai Refinery has established calibration, maintenance and Quality Assurance (QA) procedures for the Refinery Flare flow meter.
Temperature monitor accuracy	± 1% over the normal range of temperature measured, expressed in degrees Celsius, or 2.8 degrees C, whichever is greater.	CD Appendix 1.10	Per the manufacturer, the flow meter meets this requirement
Temperature monitor QA/QC	Conduct calibration checks at least annually; conduct calibration checks following any period of more than 24 hours throughout which the temperature exceeded the manufacturer's specified maximum rated temperature or install a new temperature sensor. At least quarterly, inspect all components for integrity and all electrical connections for continuity, oxidation, and galvanic corrosion, unless the Continuous Parameter Monitoring System (CPMS) has a redundant temperature sensor. Record the results of each calibration check and inspection.	CD Appendix 1.10	The Kenai Refinery has established calibration, maintenance, and QA procedures for the temperature monitor for the Refinery Flare flow meter.
Location of temperature sensor	Provides a representative temperature; shield the temperature sensor system from electromagnetic interference and chemical contaminants.	CD Appendix 1.10	The location and installation of the Refinery Flare flow meter temperature sensor meets the CD requirements.
Pressure monitor accuracy	± 5 % over the normal range or 0.12 kPa, whichever is greater.	CD Appendix 1.10	Per the manufacturer, the flow meter pressure sensor meets this requirement.

Vent Gas Flow Meter	CD Specification Requirements	Reference	Design Specifications
Pressure monitor QA/QC	Review pressure sensor readings at least once a week for straight line (unchanging) pressure and perform corrective action to ensure proper pressure sensor operation if blockage is indicated. Using an instrument recommended by the sensor's manufacturer, check gauge calibration and transducer calibration annually; conduct calibration checks following a period of more than 24 hours throughout which the pressure exceeded the manufacturer's specified maximum rates pressure or install a new pressure sensor. At least quarterly, inspect all components for integrity and all electrical connections for continuity, and all mechanical connections for leakage, unless the CPMS has a redundant pressure sensor. Record the results of each calibration check and inspection.	CD Appendix 1.10	The Kenai Refinery has established calibration, maintenance, and QA procedures for the pressure monitor for the Refinery Flare flow meter.
Location of pressure sensor	Provides a representative measurement of the pressure and minimizes or eliminates pulsating pressure, vibration, and internal and external corrosion.	CD Appendix 1.10	The location of the Refinery Flare flow meter pressure sensor meets the CD requirements.

In accordance with the requirements of Paragraph 118, the Kenai Refinery installed a gas chromatograph (GC) to monitor Vent Gas composition. The GC was installed in September 2016, prior to the required installation date of April 1, 2017. The GC completes at least one cycle of operation for each successive 15-minute Block Average Period to meet the requirements of Paragraph 122. The GC meets the applicable requirements of CD Appendix C-1.10 Section V.

Table 2-3 Main Refinery Flare Gas Chromatograph Information Requirements

Gas Chromatograph	CD Specification Requirements	Reference	Design Specifications
Type	None	127.e	Gas Chromatograph (GC)
Make	None	127.e	Siemens
Model	None	127.e	MAXUM II
Range	None	127.e	Constituent-dependent, See "Constituents Measured" for specific ranges for each compound
Precision	None	127.e	± 2%
Calibration, maintenance, and Quality Assurance (QA) procedures	None	127.e	The Kenai Refinery has established calibration, maintenance, and QA procedures for the Refinery Flare GC.
Accuracy	As specified in Performance Specification 9 of 40 C.F.R. Part 60, Appendix B.	127.e; CD Appendix 1.10	The Refinery Flare GC's accuracy is in line with Performance Specification 9 of 40 C.F.R. Part 60, Appendix B.
8-Hour Repeatability	± 0.5% of full scale for ranges between 2-100% of full scale; ± 1% of full scale for ranges between 0.05-2% of full scale; ± 2% of full scale for ranges between 50-500 ppm; ± 3% of full scale for ranges between 5-50 ppm; ± 5% of full scale for ranges between 0.5-5 ppm.	CD Appendix 1.10	The 8-hour repeatability of the Refinery Flare GC meets the requirements of the CD.
Minimum Sampling Frequency	Every 15 minutes.	CD Appendix 1.10	Less than or equal to 15 minutes

Gas Chromatograph	CD Specification Requirements	Reference	Design Specifications
Constituents Measured	Hydrogen Carbon monoxide (optional) Methane Ethane Ethene Propane Propene 2-Methylpropane Butane Butenes and 1,3 butadiene N-pentane Acetylene (optional) Propadiene (optional) Hydrogen sulfide (optional)	CD Appendix 1.10	Hydrogen (0-100 mol%) Carbon monoxide (0-50 mol%) Methane (0-100 mol%) Ethane (0-100 mol%) Ethene (0-100 mol%) Propane (0-100 mol%) Propene (0-100 mol%) 2-Methylpropane (0-100 mol%) Butane (0-100 mol%) Butenes and 1,3 butadiene (0-100 mol%) N-pentane (0-100 mol% for C5+ hydrocarbons)
Minimum Sampling Line Temperature	60°C	CD Appendix 1.10	60°C
Sampling Location	Where technically feasible, the sampling location should be at least two equivalent duct diameters downstream from the nearest control device, point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate occurs. The location should not be close to air in-leakages. Where technically feasible, the location should also be at least 0.5 diameters upstream from the exhaust or control device.	CD Appendix 1.10	The Refinery Flare GC's sampling location meets the requirements of the CD.

3.0 Flare Connections

3.1 Description of Flare Connection Mapping Process

All refinery Flaring Process Units, ancillary equipment, and Fuel Gas Systems connected to the Main Refinery Flare, as required by Paragraph 127.a, are identified in the Waste Gas maps included in Appendix B.

The Kenai Refinery conducted flare mapping of connections for the 40 CFR Part 60 Subpart Ja Flare Management Plan due November 11, 2015. For this Consent Decree Flare Management Plan (CDFMP), the Subpart Ja list of connections was reviewed and updated. Flare connections were determined using piping and instrumentation diagrams (P&IDs) and input from experienced process engineers and operators. Flare connections will be kept up-to-date using the refinery's management of change (MOC) process. The Environmental Checklist in tandem with the new Flare and Relief Checklist, which is required for every physical change (except those which are direct replacements using in-kind equipment), includes changes to the Flare which could affect connections, contributions, or Flare operation.

3.2 Main Refinery Flare Connection List

The Main Refinery Flare has many connections including pressure relief valves (PRVs), control valves (CVs), knock-out pots, manual valves, blowdown valves, pressure controllers, open connections (for venting small quantities of light hydrocarbon entrained in otherwise non-volatile liquids), sample connections, analyzer vents, and others. The detailed list of the flare connections is included in Appendix B.

4.0 Pressure Relief Valves

The CD, under Paragraph 127.f, requires a detailed description of each PRV, including type of relief device (e.g., rupture disc, valve type), diameter of the relief valve, set pressure, and listing of the Prevention Measures implemented. As allowed by the CD, this information is maintained on-site and is not included within this FMP. The required information is available upon request from the EPA or the Applicable State Co-Plaintiff (State of Alaska). For the Prevention Measures analysis, the Kenai Refinery process engineering, operations, and environmental staff reviewed P&IDs, Process Hazard Analyses (PHAs), and relevant equipment files to complete the review and documentation for each PRV.

5.0 Waste Gas Characterization and Mapping

The CD, within Paragraph 127.h and Appendix C-1.11, requires determination of the 30-day Rolling Average Waste Gas flow rate, the Baseload Waste Gas Flow Rate, and the identification of constituent gases within the Waste Gas. In addition, Waste Gas Mapping is required using a combination of instrumentation, monitoring, and/or engineering calculations.

5.1 Waste Gas Characterization

Paragraphs 127.h.i-iii require evaluation of the volumetric Waste Gas Flow Rate, Baseload Waste Gas Flow Rate, and Waste Gas.

5.1.1 30-day Rolling Average Volumetric Flow Rate

Paragraph 127.h.i requires identification of the 30-day Rolling Average Waste Gas flow rate between December 1, 2015 and November 30, 2016.

The 30-day Rolling Average Waste Gas flow for the required time period is shown in Figure 1. As allowed under Paragraph 127.h.i, the flow has been delineated between all Waste Gas flow excluding hydrogen, nitrogen, oxygen, carbon monoxide, and carbon dioxide and the flow of these constituents. Water is not directly measured and has thus not been delineated. Flare flow and composition were determined using the instruments described in Section 2.1.1.1 above.

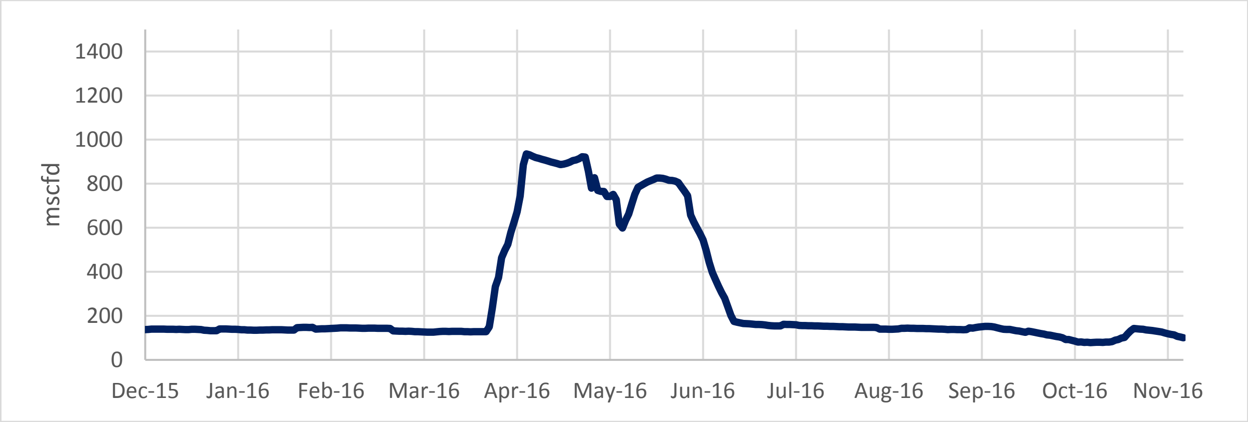


Figure 1 **30-day Rolling Average of Waste Gas for the Main Refinery Flare between December 1, 2015 and November 30, 2016**

The Kenai Refinery conducted a full facility turnaround from April 19, 2016 through June 8, 2016. This planned event produced high Waste Gas flows. The Prevention Measures described in Section 6.0 below have been implemented to reduce flare flow for future Startup and Shutdown events.

The Flare Gas Recovery System (FGRS) began operation on September 21, 2016.

5.1.2 Baseload Waste Gas Flow Rate

In accordance with Paragraph 127.h, the Baseload Waste Gas Flow Rate to the Main Refinery Flare is required for December 1, 2015 to November 30, 2016. The Baseload Waste Gas Flow Rate does not include periods of Startup, Shutdown, and Malfunction. Based on the definition of Waste Gas, the Baseload Waste Gas Flow Rate also does not include inert constituents or Pilot Gas, Total Steam, Assist Air, minimum Sweep Gas, and Purge Gas.

The Baseload Waste Gas Flow Rate was determined by measuring the volumetric flow rate and monitoring the constituents. The Baseload Waste Gas Flow Rate from December 1, 2015 to November 30, 2016 was 135 mscfd prior to the installation of FGRS and 96.5 mscfd after FGRS installation. The overall Baseload Waste Gas Flow Rate excluding the turnaround was 126 mscfd. All Startup, Shutdown, or Malfunction flaring events that were excluded from the Baseload Waste Gas Flow Rate, in accordance with Paragraph 127.h.ii, are provided in Table 5-1 below.

Table 5-1 Startup, Shutdown and Malfunction events that were excluded from the Baseload Waste Gas Flow Rate in accordance with Paragraph 127.h.ii

Description of Event	Date Range	Startup, Shutdown, or Malfunction (SSM)
Refinery Turnaround	4/18/2016 – 7/10/2016	Full refinery turnaround

5.1.3 Identification of Waste Gas Constituent Gases

As required by Paragraph 127.h.iii, the constituent gases within the Waste Gas of the Main Refinery Flare header have been determined for baseload conditions. The typical range of constituent concentrations was determined during baseload conditions using engineering evaluations, measurements, and monitoring. The composition below is for the Waste Gas in the flare header, which is normally recovered by the FGRS.

For the Kenai Refinery, the GC monitors the required constituents in a location representative of the entire flow to the Flare tip. Because the Main Refinery Flare did not have a water seal until Startup of the FGRS, the refinery was able to monitor the baseload composition directly. The baseload Waste Gas contributors did not change with Startup of the FGRS and therefore the previous direct measurements were utilized for the analysis in Table 5-2 below.

Table 5-2 Refinery Flare Waste Gas Composition under baseload conditions

Component	Average Mole % (Typical Range)
Hydrogen	25% (11-38%)
Argon/Oxygen	0%
Nitrogen	1% (0-3%)
Carbon Monoxide	0%
Carbon Dioxide	0%
Methane	61% (42-81%)
Ethylene	0%
Ethane	1% (0-1%)
Hydrogen Sulfide	0%
Propane	1% (1-2%)
Propylene	0%
Isobutane	1% (0-2%)
Butane	1% (0-1%)
C6+	3% (1-6%)
C4 Olefins	0%
C5s	3% (1-4%)
Water (by difference)	3% (0-5%)

5.2 Waste Gas Mapping

Paragraph 127.h.iv requires identification and estimation of the flow from each Flaring Process Unit Flare header to the main flare header(s) and identification of each Waste Gas tie-in consistent with CD Appendix C-1.11. Appendix B provides this required information.

The flows through Flaring Process Unit headers six inches or greater in diameter are quantified, where technically feasible, as required by CD Appendix C-1.11. The flow estimates were determined by process engineering staff by reviewing flare connections, determining which contributed regular flow, and quantifying the cumulative flow through each Flaring Process Unit Header. The flow estimates were completed using a combination of historical operations data and engineering calculations.

As the flare header map in Appendix B shows, many of the headers are in series. The sum of the flows listed in Table 5-3 are thus greater than the actual baseload flow to the FGRS, which is 159.3 mscfd.

Table 5-3 Refinery Flare Header Contributions

Flare Process Unit Header	Flow (mscfd)
Q_{Amine}	7.6
Q_{Crude}	10.2
Q_{DDU}	5.5
Q_{DIB}	1.2
Q_{H2}	13.5
Q_{HCK1}	6.9
Q_{HCK2}	10.2
Q_{LPG}	10.2
Q_{Mega}	1.8
Q_{PRIP}	151.5
Q_{REF1}	0.1
Q_{REF2}	0
Q_{SWS}	3.4
Q_{VAC}	8.2

6.0 Prevention Measures

6.1 Requirements

Per Paragraph 127.j of the CD, Tesoro shall describe and evaluate all Prevention Measures, including a schedule for the expeditious implementation and commencement of operation of all Prevention Measures, to address the following:

i. Flaring that has occurred or may reasonably be expected to occur during planned maintenance activities, including Startup and Shutdown. The evaluation shall include a review of flaring that has occurred during these activities in the past three years and shall consider the feasibility of performing these activities without flaring.

ii. Flaring that may reasonably be expected to occur due to issues of gas quantity and quality. The evaluation shall include an audit of the flare gas recovery capacity of each Covered Flare subject to this requirement as set forth in Appendix C - 2.1, the capacity including internal piping systems and the amine treating capacity available for Waste Gases including any limitations associated with the amine treating of Waste Gases for use as fuel. The evaluation shall consider the feasibility of reducing flaring through the recovery, treatment, and use of the Waste Gas.

iii. Flaring caused by the recurrent failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. The evaluation shall consider the adequacy of existing maintenance schedules and protocols for such equipment. A failure is "recurrent" if it occurs more than twice during any five year period as a result of the same root cause.

Prevention Measure is a defined term in the Consent Decree: *Prevention Measure shall mean an instrument, device, piece of equipment, system, process change, physical change to process equipment, procedure, or program to minimize or eliminate flaring.*

6.2 Approach

To develop this plan, experienced representatives of the Operations, Process Engineering, and Environmental departments evaluated historical and potential flaring events due to Startup and Shutdown, gas quantity and quality, recurrent failures, emergencies, and other causes. The group identified Prevention Measures warranting further review. Evaluation of potential Prevention Measures was primarily based on the impact to overall flare emissions. Additional considerations included secondary environmental impacts, operability, and feasibility.

Secondary environmental impacts are a critical consideration as a singular focus on a single emission point may lead to additional emissions elsewhere. All emission points must be considered when determining reduction efforts at a single point, including Flares. Operability considerations are included to preserve operational stability and predictability. If operability is compromised, unstable operation may lead to unanticipated secondary environmental impacts. Feasibility is a key consideration to ensure the refinery's focus is on actionable Prevention Measures.

The evaluation of Prevention Measures included review of historical flare flow information, assessments of the impacts of the FGRS, and input from experienced operators and engineers.

The review of historical flare information allowed refinery personnel to evaluate the flare performance resulting from past and current operations. Historical information was used to identify periods of high flow which were then investigated to determine the causes.

The FGRS began operation in September 2016. The FGRS has been evaluated to determine its utility both as a means of eliminating flaring during all modes of planned operation and as a means of eliminating or reducing flaring during process upsets and emergencies. Historical flaring events were evaluated to determine how they would have been affected by the FGRS and how the FGRS can be used to eliminate or minimize flaring under similar conditions in the future.

Experienced operators and engineers analyzed historical flaring and the anticipated impacts of, and optimization of, the FGRS. Additionally, they provided input on dynamics of the flare system not discernable from historical analysis alone. Following identification of conditions leading to flaring or the risk of flaring, the operators and engineers conducted the analysis of the impacts, effectiveness, and feasibility of potential Prevention Measures.

Specific Prevention Measures are included under each category below. They are numbered sequentially to provide consistent identification for planning and documentation.

6.3 Evaluation of Flaring Due to Startup and Shutdown

6.3.1 Evaluation of Flaring Due to Startup and Shutdown

6.3.1.1 Approach

The evaluation of flaring due to Startup and Shutdown included the evaluation described in Section 6.2 above. Flare flow due to Startup and Shutdown in the past three years was then assessed to determine how and if it could be minimized or prevented as required by Paragraph 127.j.i.

6.3.1.2 Primary Causes of Flaring Due to Startup and Shutdown

Startup and Shutdown flaring events fall into two categories: those that can be conducted without flaring and those for which flaring may be (or is likely) unavoidable.

Startup and Shutdown activities for which flaring can be eliminated range from small-scale maintenance activities on single pieces of equipment up to full Process Unit Shutdowns. The key factors in determining whether flaring can be eliminated is whether there are processes capable of consuming the material vented from the equipment or units being Shutdown. Factors leading to flaring thus include gas routing and Fuel Gas demand limitations. Routing limitations may include pressure differentials, pipe configurations, operability, and other factors. Fuel Gas demand limitations may be localized to the processes accepting vented material or refinery-wide. The overall "robustness" of a refinery's Fuel Gas System (i.e., the scale of its Fuel Gas producers and consumers) relative to the scope of a Startup or Shutdown is a critical factor for the plant's ability to accommodate this activity without flaring.

6.3.2 Refinery-Wide Prevention Measures for Flaring Due to Startup and Shutdown

This section describes the Prevention Measures implemented across the entire refinery to prevent or minimize flaring due to Startup and Shutdown. The implementation scope and schedule for each Prevention Measure are specified below. Prevention Measures specific to individual Flaring Process Units are described in Section 6.3.3 below.

6.3.2.1 Startup and Shutdown Sequencing to Eliminate or Minimize Flaring

Background

The key strategy for preventing and minimizing flaring during Startup and Shutdown is maximizing the amount of material vented from equipment which can be consumed by refinery processes rather than flared. It is thus desirable to keep Fuel Gas consumers operating as long as possible while the processes that produce Fuel Gas are Shutdown. Alternatively, upon Startup, bringing Fuel Gas consumers online first is necessary to prevent or minimize flaring.

Though the refinery will schedule Startup and Shutdown sequences with material and Fuel Gas balances as significant factors, there are challenges which can preclude complete implementation of this strategy. These challenges include storage capacity for both feedstocks to and products from Fuel Gas consuming units, gas routing limitations, and operational stability.

In addition to the Startup and Shutdown sequences, the rate at which these activities are conducted can affect the volume of material flared. At times it may be advantageous to conduct a certain aspect of the event slowly, such as when a decreased vent rate allows excess material to be consumed by another refinery process instead of exceeding the consumer's capacity. Alternatively, there are conditions when a faster rate of venting may be required. An example of this condition would be venting of inert constituents that cannot safely be routed to the Fuel Gas System and must be flared.

Prevention Measures

1001. The refinery has established a Flare Coordinator role. The Flare Coordinator is responsible for coordinating flaring and managing all Flare plans and contingencies. The role of Flare Coordinator will be filled by individuals as documented by the Kenai Environmental Department based on the current operating conditions.
1002. Plans for full process unit Startup and Shutdown events where flaring is anticipated will include an evaluation of the rate at which venting should occur to prevent or minimize flaring.
1003. Sequences for full process unit Startup and Shutdown events where flaring is anticipated will be planned to balance the Fuel Gas System to the degree possible based on storage capacity, gas routing limitations, and operational stability. Implementation of the plan will be led by a Flare Coordinator to coordinate venting activities.

1004. Plans for full process unit Startup and Shutdown events where flaring is anticipated will include monitoring of FGRS capacity to be coordinated by the Flare Coordinator.

1005. The refinery will evaluate Startup and Shutdown events which lead to flaring that exceeds flare caps to determine if changes in procedures, plans, or equipment configurations can effectively prevent or minimize flaring in the future.

Schedule for Implementation

Prevention Measure #1001 has been implemented and documented by the Kenai Environmental Department.

Prevention Measures #1002-1004 within this section will be implemented prior to planned Shutdowns.

Prevention Measure #1005 will be an ongoing activity following Startup and Shutdown events that lead to exceeding flare caps.

6.3.2.2 Minimizing the Quantity of Gas Required to Deinventory and Render Vessels Inert for Maintenance

Background

To conduct maintenance on refinery equipment, it must first be deinventoried of its operating contents then decontaminated. The traditional means of inerting equipment is to purge the vapor space with steam or nitrogen.

Preventing or minimizing the flaring is accomplished by maximizing consumption of vented material as described in Section 6.3.2.1 above and by reducing the quantity of gas required to render equipment inert. The Prevention Measure below describes the actions the refinery will take to minimize the volume of vented material, when possible.

Prevention Measure

1006. Startup and Shutdown plans for events where flaring is anticipated may include an evaluation of whether alternative means of de-inventorying and inerting vessels is feasible and necessary to prevent or minimize flaring. Chemical cleaning, total condensing of steam, and reducing the volume of nitrogen or other gases may be considered when possible.

Schedule for Implementation

Prevention Measure #1006 has been reviewed and will be incorporated into future Shutdown events.

6.3.3 Unit-Specific Prevention Measures for Flaring Due to Startup and Shutdown

This section describes the Prevention Measures implemented for specific Process Flaring Units or flare networks to prevent or minimize flaring due to Startup and Shutdown. The implementation scope and schedule for each Prevention Measure are specified below.

6.3.3.1 Startup Sequence for LPG and DIB Unit

Background

The refinery considered its historical Liquefied Petroleum Gas (LPG) Unit Startups and identified potential improvements that could minimize flaring.

Prevention Measure

1501. The refinery will revise Startup procedures to utilize the Deisobutanizer (DIB) Unit as surge capacity to regulate flow to the LPG Unit to minimize flaring. These updates include the steps to line up the DIB Unit to act as a larger surge drum for V-301 to have a more consistent feed supply.

Schedule

The procedure update required by Prevention Measure #1501 will be completed by Summer 2017.

6.3.3.2 Shutdown for Maintenance Window Procedure to Balance Fuel Gas and the FGRS

Background

The Kenai refinery commenced operation of the FGRS in September 2016. To maximize the effectiveness of the FGRS, the refinery is updating its Shutdown for Maintenance Window procedures to maintain Fuel Gas balance to the degree possible.

Prevention Measure

1502. The refinery will update Shutdown for Maintenance Window procedures to maintain Fuel Gas balance to the degree possible under FGRS.

Schedule

The procedure updates required by Prevention Measure #1502 will be implemented by Spring 2018.

6.3.3.3 Hydrocracker Unit Depressure Test Optimization

Background

In the past the Hydrocracker Unit would test the de-pressuring rate of each Shutdown resulting in significant flare flow.

Prevention Measure

1503. The refinery will evaluate function testing of the valves instead of de-pressuring the unit to the FGRS or the Flare.

Schedule

Prevention Measure #1503 will be completed and incorporated into procedure prior to the 2018 Hydrocracker catalyst change.

6.3.3.4 DIB Procedure to Boil LPG to Fuel Gas instead of Flare

Background

DIB Unit Shutdowns included de-pressuring LPG to the Fuel Gas System but, once the DIB is at Fuel Gas System pressure, the rest of the unit pressure was vented to the Flare.

Prevention Measure

1504. The refinery will evaluate Shutdown procedures for the DIB Unit to minimize flaring.

Schedule

Prevention Measure #1504 evaluation is complete and procedures will be modified by Winter 2018.

6.3.3.5 PRIP Depressuring

Background

During unplanned Shutdowns of the Partial Recycle Isomerization Process (PRIP) Unit, gas is depressured to the FGRS.

Prevention Measure

1505. The refinery will evaluate alternate opportunities during PRIP Shutdowns to minimize flaring.

Schedule

Prevention Measure #1505 was completed. The evaluation will be documented with the Kenai environmental group by Summer 2017.

6.3.3.6 Amine Change Out

Background

The refinery amine change out can be performed during normal operation or Shutdowns. This activity during Shutdown may indirectly result in flaring due to schedule delays.

Prevention Measure

1506. The refinery will evaluate optimizing the amine change out process.

Schedule

The evaluation required by Prevention Measure #1506 is complete.

6.4 Evaluation of Flaring Due to Gas Quantity and Quality

6.4.1 Evaluation of Flaring Due to Gas Quantity and Quality

6.4.1.1 Approach

The evaluation of flaring due to gas quantity and quality included the evaluation described in Section 6.2 above, as well as the requirements specified by Paragraph 127.j.ii.

Paragraph 127.j.ii requires that the evaluation of flaring due to issues of gas quantity and quality include an audit of the FGRS capacity, the capacity including internal piping systems, and the amine treating capacity available for Waste Gases including any limitations associated with the amine treating of Waste Gases for use as fuel. The evaluation must also consider the feasibility of reducing flaring through the recovery, treatment, and use of Waste Gas.

The FGRS capacity, including Compressors and associated systems, meets the requirement of Paragraph 130. The amine treating capacity is sufficient for the Compressors' capacity.

6.4.1.2 Primary Causes of Flaring Due to Gas Quantity and Quality

Flaring due to gas quantity may be caused either by momentary exceedance of the FGRS Compressors' capacities which leads to breaking the water seal or by an overall refinery Fuel Gas imbalance during which excess gas is flared via the water seal bypass line for specific scenarios authorized by the CD. The frequency and magnitude of either condition may be exacerbated by high baseload flow to the FGRS Compressors. Prevention Measures to prevent or minimize flaring due to gas quantity thus focus on all venting which affects the baseload flow to the Compressors, high flow rate venting which may exceed the Compressors' capacities, and the overall Fuel Gas balance.

Flaring due to gas quality occurs when the recovered Vent Gas composition is not suitable for combustion in the refinery process heaters and/or boilers and other fuel-burning equipment. Such conditions may include excess hydrogen or nitrogen. Fuel Gas quality may also be impacted by an upset in the Fuel Gas amine treating system. Prevention Measures for gas quality are thus focused on the performance and reliability of the FGRS and the amine system.

6.4.2 Refinery-Wide Prevention Measures for Flaring Due to Gas Quantity and Quality

This section describes the Prevention Measures implemented across all refinery Flaring Process Units to prevent or minimize flaring due to gas quantity and quality. The implementation scope and schedule for each Prevention Measure are specified below.

In addition to the Prevention Measures cited in Sections 6.4.2, several of the Prevention Measures in Sections 6.3 and 6.5 impact conditions under which flaring has occurred or may occur due to gas quantity. Such Prevention Measures are included outside Section 6.4 because the root causes can more appropriately be categorized as based on Startup, Shutdown, or recurrent failures.

6.4.2.1 Maximizing FGRS Availability and Effectiveness

Background

The FGRS is one of the most effective means of preventing and minimizing flaring. As such, maximizing its availability and recovery effectiveness is critical.

Maximizing FGRS availability involves effective preventative maintenance to prevent equipment failures and coordinating maintenance of the FGRS and associated systems with times when the risk of flaring is minimized.

Effective preventative maintenance includes following established maintenance practices and procedures, as well as incorporating into the preventative maintenance program any site-specific knowledge gained through Compressor operations.

Coordinating maintenance of the FGRS and associated systems with times when the risk of flaring is minimized involves several conditions. It is optimal to conduct FGRS maintenance when Flaring Process Units are offline. When FGRS maintenance must be conducted while Flaring Process Units are online, limiting venting while maintenance is conducted is critical. Limiting venting may include deferring planned maintenance on equipment that will produce Vent Gas to avoid periods when the FGRS is operating at reduced recovery rates or inoperable, conducting maintenance at low production rates, or other means of determining that there is a low risk of flaring during FGRS maintenance.

Maximizing FGRS recovery effectiveness involves minimizing the baseload flow to the Compressors to reserve capacity for process upsets and emergencies, scheduling necessary venting to the flare header to avoid breaking the water seal, coordinating venting activities as schedules change, and effectively staging the Compressors to take advantage of the full recovery capacity by using techniques to have the spare Compressor in standby mode.

Minimizing baseload flow to the Compressors is achieved by evaluating all anticipated non-emergency venting. This is accomplished via the evaluations described in this section and ongoing evaluation of flare performance and FGRS loads.

Scheduling venting to avoid breaking the water seal will involve, for both small and large scale activities, ensuring venting occurs in a sequence which allows the refinery to maintain the water seal. Scheduling venting involves accurate estimates of venting volumes and durations.

Coordinating venting activities and adapting to schedule changes will be achieved by communication with the Flare Coordinator. This communication will ensure the monitoring of the FGRS and use of the flare headers can be coordinated to prevent, to the degree practicable, flaring due to the discretionary venting to the flare header during planned maintenance.

When Vent Gas loads increase beyond the capacity of the Primary Compressor, Secondary Compressor staging is important to ensure the water seal is not broken before the second Compressor is online to recover the additional Vent Gas load.

Prevention Measures

2001. The refinery has established preventative maintenance schedules for the FGRS Compressors and associated systems.

2002. To the extent possible, the refinery will coordinate FGRS maintenance to stay within the capacity of the FGRS Compressors.

2003. Planned use of the flare header will be coordinated with the Flare Coordinator to minimize contributions to the flare header in a manner that maintains the water seal to the maximum degree practicable.

2004. Discretionary venting due to planned maintenance to the flare header will be coordinated with the Flare Coordinator. The Flare Coordinator will inform operators of the Compressor capacity available and defer any venting to the header for which the Compressors do not have sufficient capacity.

2005. The refinery will evaluate venting scenarios that may exceed the temperature limit of the FGRS Compressors to determine if procedure or equipment changes may mitigate the risk of flaring.

Schedule for Implementation

Prevention Measures #2001-2005 have been completed.

6.4.2.2 Operator Training and Awareness

Background

All Prevention Measures depend on effective implementation by refinery operators. The refinery has therefore focused on operator training and awareness of specific Prevention Measures and general approaches to minimizing flaring.

Prevention Measures

2007. General awareness training
   a. All operators will be trained on the procedures that were altered to prevent or mitigate flaring during Startup, Shutdown, maintenance and normal operations situations.

2008. FGRS operator training
   a. All affected FGRS operators will train on unit training manuals with a focus on maintaining a reliable, operational FGRS as well as troubleshooting and responding to changes in flaring process conditions.

Schedule

The training and documentation required by Prevention Measures #2007 and #2008 above have been completed.

6.4.2.3 Blowdown Rate and Coordination

Background

Many small vessels require regular blowdowns to the Flare to purge accumulated liquid and/or vapor. Routine operational blowdowns are within the operational capacity of the FGRS and will be coordinated with the Flare Coordinator.

Prevention Measure

2009. The refinery will conduct vessel blowdowns, when possible, within the capacities of the FGRS Compressors and in coordination with the Flare Coordinator.

Schedule

Prevention Measure #2009 is complete.

6.4.2.4 Leak Prevention

Background

Flare connection leaks, including those from PRVs, represent unnecessary baseload to the FGRS Compressors. As such, the refinery has contracted leak detection monitoring to ensure leaks are minimized.

Prevention Measure

2010. The refinery will utilize, at a minimum, an initial acoustic monitoring survey of all PRVs connected to the Flares and other connections known to have leaked or have a high risk of leaking to detect leaks as soon as practicable and develop corrective actions. This has been completed for the large, high-pressure PRVs.

Schedule

The survey of large, high-pressure relief valves identified in the CD, Appendix 2.2 has been completed. Corrective actions will be implemented in accordance with Paragraph 116 of the CD. The survey for all other hydrocarbon PRVs directed to a Covered Flare will be completed by Summer 2022. Corrective actions for these remaining PRVs will be completed during the first turnaround that occurs after eighteen months following the associated survey.

6.4.2.5 Fuel Gas Shedding

Background

The refinery has reviewed the overall Fuel Gas balance.

Prevention Measure

2011. The Fuel Gas shedding plan will be updated to ensure natural gas is not imported into the Fuel Gas drum during periods of Fuel Gas imbalance which could lead to increased flaring.

Schedule

The procedure updates required by Prevention Measure #2011 have been completed.

6.4.2.6 MOC Checklist Update

Background

The refinery utilizes an environmental checklist as part of its MOC program.

Prevention Measure

2012. A Flare and relief MOC checklist will be developed to capture all changes to the Flare and its contributors.

Schedule

The MOC checklist updates required by Prevention Measure #2012 have been completed.

6.4.2.7 Subheader Flow Meters

Background

The Kenai Refinery has made significant improvements in its flaring performance through its flaring troubleshooting.

Prevention Measure

2013. The refinery will evaluate installing flare subheader flowmeters to aid in troubleshooting increases in FGRS baseload.

Schedule

Preventative Measure #2013 will be evaluated by Spring 2018.

6.4.2.8 Hydrocracker Recycle Gas Purity

Background

Hydrocracker recycle gas minimum purity can be maintained by venting recycle gas to either Flare or Fuel Gas scrubbing.

Prevention Measure

2014. To limit flaring, vented recycle gas may be routed to Fuel Gas scrubbing as the primary destination.

Schedule

Preventative Measure #2014 has been completed.

6.4.2.9 Sweep Gas Minimum Rates and Monitoring

Background

The introduction of Sweep Gas serves a critical safety function but also represents a baseline load on the FGRS Compressors. Minimizing the risk of flaring due to gas quantity thus necessitates the minimization of Sweep Gas flow rates. In conjunction with the requirements of Paragraphs 114 and 115 of the CD, the refinery has evaluated the minimum Sweep Gas flow rates and enacted the monitoring and control equipment necessary to operate at these minimums. The details of the minimum Sweep Gas flow rates and monitoring equipment are described in Sections 2.0 and 5.0 of this FMP.

Prevention Measure

2015. The refinery has evaluated the minimum Sweep Gas flow rates required to operate the flare headers safely and has installed the monitoring and control equipment necessary to provide adequate control over the minimum flow rates.

Schedule

The evaluation and control requirements specified by Prevention Measure #2015 have been enacted.

6.5 Evaluation of Flaring Due to Recurrent Failure of Equipment and Reliable Operation

6.5.1 Evaluation of Flaring Due to Recurrent Failures

6.5.1.1 Approach

The evaluation of flaring due to recurrent failures included the evaluation described in Section 6.2 above, as well as the requirements specified by Paragraph 127.j.iii.

Paragraph 127.j.iii requires the evaluation of flaring due the recurrent failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. The evaluation must consider the adequacy of existing maintenance schedules and protocols for such equipment. A failure is "recurrent" if it occurs more than twice during any five year period as a result of the same root cause.

6.5.2 Refinery-Wide Prevention Measures for Flaring Due to Recurrent Failures

6.5.2.1 Evaluation of Compressor Vibration Trips

Background

Compressors are continuously monitored to protect the personnel, equipment, and then to minimize flaring.

Prevention Measure

3001. The refinery has evaluated Compressor vibration trip levels to appropriately balance process and personnel safety with gas recovery. The results of this evaluation for key Compressors includes:
   a. FGRS Compressors C-810A/B
      i. The trips were removed for normal operating conditions due to past experience with high reliability of ring water Compressors. Vibration trips were added for auto start of the second Compressor to ensure integrity when no personnel are present to witness.
   b. Compressor C-401
      i. C-401 vibrations trips were modified for initial Startups to avoid unnecessary delays.
      ii. C-401 vibration trips were modified for normal operation to limit spurious trips that would result in depressuring the hydrocracker to Flare.

c. Compressor C-402A/B

Schedule

The evaluation required by Prevention Measure #3001 is complete.

6.5.2.2 Power Reliability

Background

Historically, the incoming external power supply was not reliable and resulted in several refinery-wide process upsets.

Prevention Measure

3002. The refinery has implemented the following changes to improve electrical power reliability:
   a. A new external power substation was commissioned in October 2010.
   b. The refinery Cogeneration units received turbine package upgrades to increase reliability in 2013/2014.

Schedule

The improvements required by Prevention Measure #3002 have been completed.

6.5.2.3 Loss of Utilities

Background

The refinery has worked to ensure the highest level of reliability in its utility systems. In addition, the refinery has procedures to respond to any utility losses.

Prevention Measure

3003. Refinery-wide utility failure emergency procedures have been reviewed to ensure the refinery response to loss of utilities prevents or minimizes flaring while maintaining process and personnel safety. Updates to procedures include:
   a. GEN-EP-004 Extended Loss of External Power
   b. GEN-EP-005 Extended Loss of Natural Gas
   c. GEN-EP-011 Central Control Room Loss of DCS
   d. GEN-EP-013 Response to Excess Water Volumes in Oil Water Sewer

Schedule

The procedure updates required by Prevention Measure #3003 have been completed.

6.5.3 Unit-Specific Prevention Measures for Flaring Due to Recurrent Failures

6.5.3.1 PSA (Pressure Swing Adsorption) Trips and Subsequent Response

Background

Over the past five years the refinery has experienced two valve failure events that contributed to flaring.

Prevention Measures

3004. Response to PSA trip procedures will be evaluated and will be updated to minimize flaring.

3005. An additional evaluation for potential valve upgrades will be conducted.

Schedule

The evaluations required by Prevention Measures #3004-3005 will be completed in two phases. The procedure evaluation and update to minimize flaring will be completed by Summer 2017 and an additional evaluation of valve reliability will be completed by Winter 2018.

6.5.3.2 Level Indication

Background

False level indication on V-404 has led to flaring during Startup. False readings led to process upsets downstream of the vessel which led to or increased the risk of flaring.

Prevention Measure

3006. The refinery will evaluate level indicator reliability for V-404 to minimize process upsets and flaring.

Schedule

The evaluation required by Prevention Measure #3006 will be completed prior to Spring 2018.

6.5.3.3 FGRS Instrumentation and Controls

Background

In order to ensure a reliable FGRS, the refinery project team added redundant instrumentation to key process indicators and thoroughly reviewed control systems and safety systems during the design and successful commissioning of the unit. A reliable FGRS is one of the most critical priorities of flare minimization.

Prevention Measure

3501. The FGRS project team identified several instrumentation priorities to improve unit reliability:
    a. All vessels were provided with dual level transmitters as well as local sight gauges.
    b. Multiple transmitters were provided for pressure and temperature safety instrumented Shutdowns in order to provide redundant indication and limit spurious trips.

c. Heat tracing was provided to limit potential freezing of the water process lines.

Schedule

Prevention Measure #3501 was completed in Fall 2016.

7.0 Minimization Assessment

The Kenai Refinery has conducted a minimization assessment as required by Paragraph 127.b. This assessment considered the capital and annual operating costs, technical feasibility, secondary environmental impacts, and safety aspects of each potential change. Installation of the FGRS has been the primary minimization effort at the Kenai Refinery and the minimization assessment focused both on maximizing the effectiveness of the FGRS and minimizing the baseload flow to the Compressors.

7.1 Description of Minimization Assessment Process

The Kenai Refinery conducted the minimization assessment by building on the evaluations conducted for the 40 CFR Part 60 Subpart Ja (Subpart Ja) FMP. Because the flare connections were mapped and reviewed during the Subpart Ja evaluation, the approach for this minimization assessment was to apply lessons learned since submission of the Subpart Ja FMP, including evaluation of flaring events, and leverage the Prevention Measures evaluations described in Section 6.0 above.

7.2 Acoustic Monitoring on all Hydrocarbon PRVs

As required by Paragraph 127.b.ii, the Kenai Refinery has established a plan and schedule for conducting acoustic monitoring on all hydrocarbon PRVs directed to the Refinery Main Flare. The Initial PRV Leak Survey required by Paragraph 116 for large, high pressure PRVs listed in Appendix C-1.2 of the CD has been completed. The monitoring schedule for all other PRVs directed to the Flare is defined in Prevention Measure #2010 above.

8.0 Reductions Based on Root Cause Analyses and Revised Schedule

This section is a placeholder for the Paragraph 128.a and b requirements to conduct a review of all Root Cause Analysis reports pursuant to 40 CFR Part 60 Subpart Ja or the CD to determine if reductions can be achieved through any corrective action. It also requires that good cause be provided for any proposed extension to the implementation schedule of any proposed project in this Initial FMP to drive further flaring reductions. This section will be updated as applicable in the first annual FMP update to be submitted by April 1, 2018.

9.0 Taking a Covered Flare Out of Service

The CD, under Paragraph 127.i, requires identification of any Covered Flare that the refinery intends to take out of service, including the date for completion of the decommissioning. Taking a Covered Flare "out of service" means physically removing piping in the Flare header or physically isolating the piping with a welded blind so as to eliminate direct piping to the Covered Flare. The Kenai Refinery does not intend to take the Main Refinery Flare out of service.

Appendix A

Flare Management Plan Revision Details

Table A-1 History of revisions

Revision	Date	Summary of Changes
1.0	April 1, 2017	Initial CDFMP

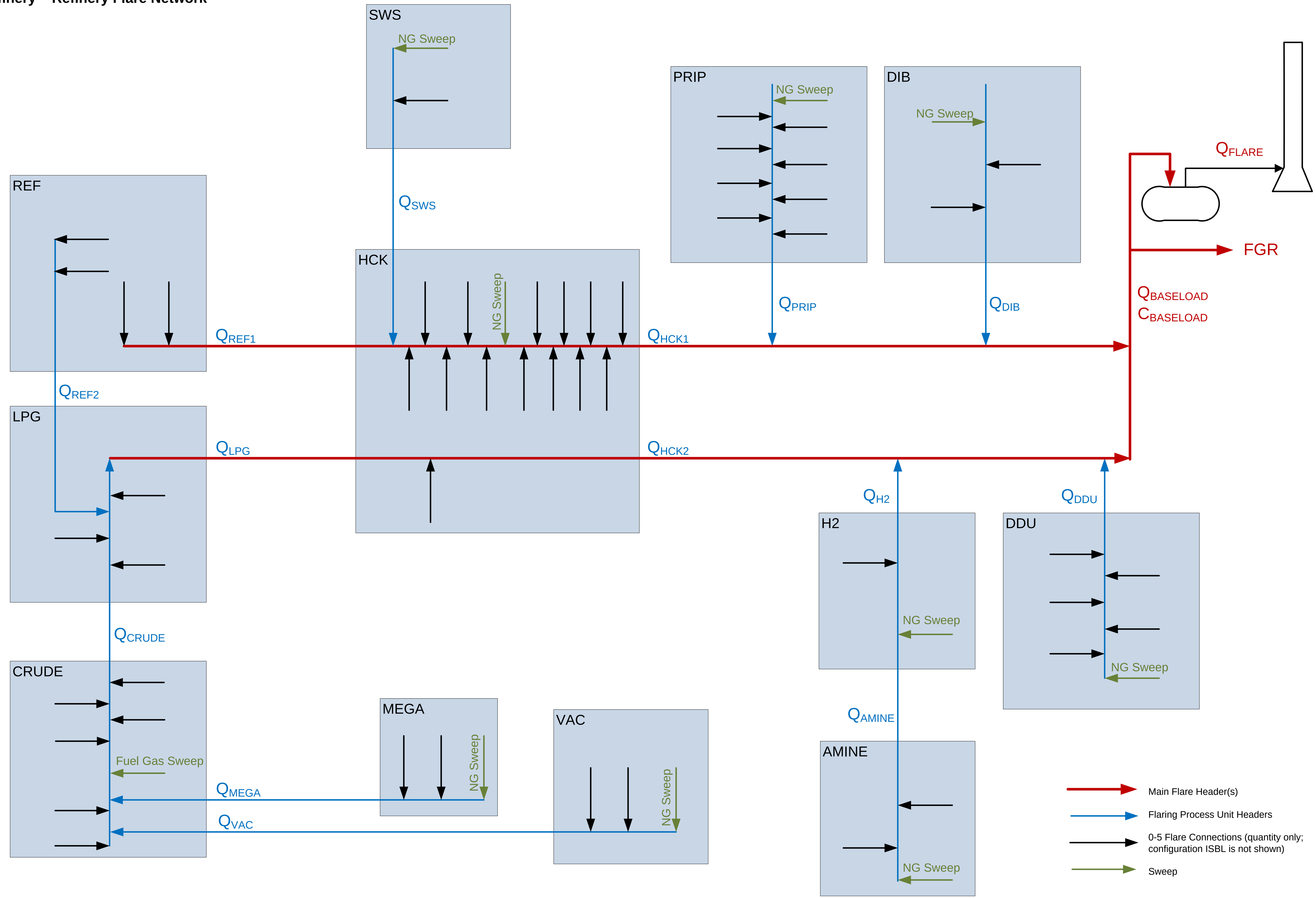
Table A-2 Changes for next revision

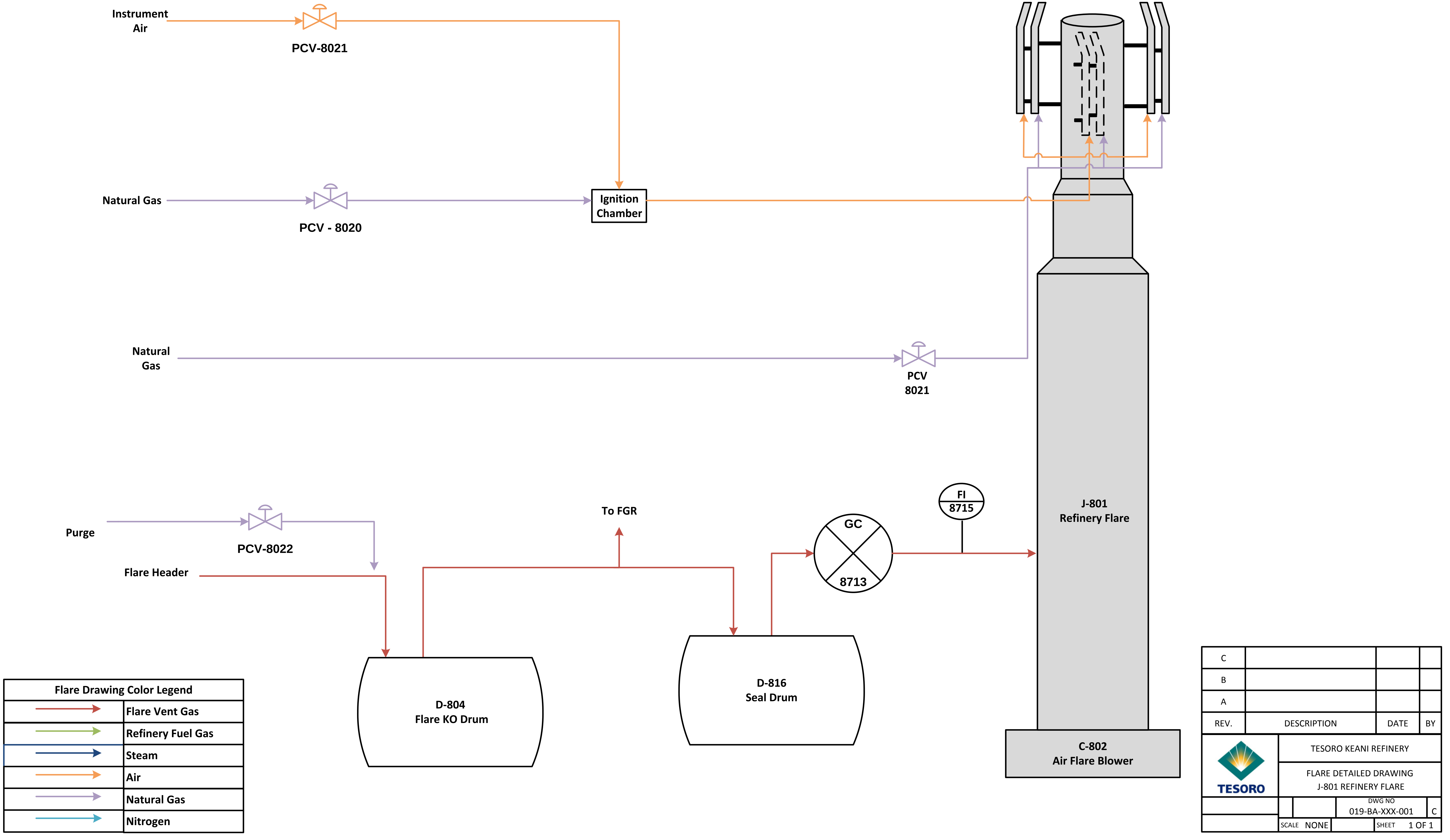
Date	Summary of Changes

Appendix B

Appendix C-1.11 Flare Connection List and Flare Maps

Kenai Refinery – Refinery Flare Network





Instrument Air
PCV-8021
Natural Gas
PCV - 8020
Ignition Chamber
Natural Gas
PCV 8021
Purge
PCV-8022
Flare Header
To FGR
GC 8713
FI 8715
J-801 Refinery Flare
D-804 Flare KO Drum
D-816 Seal Drum
C-802 Air Flare Blower
Flare Drawing Color Legend
Flare Vent Gas
Refinery Fuel Gas
Steam
Air
Natural Gas
Nitrogen
C
B
A
REV.
DESCRIPTION
DATE
BY
TESORO
TESORO KEANI REFINERY
FLARE DETAILED DRAWING
J-801 REFINERY FLARE
DWG NO
019-BA-XXX-001
C
SCALE NONE
SHEET 1 OF 1

Table B - 1 Flare Source Description Table

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
Q_{AMINE}	7.6	6 PSVs 1 Seal Pot 1 Process Valve 1 NG Sweep Gas 1 Drain 1 Other	P-526 A/B
			V-526 Vent
			PSV-5778
			PSV-5751
			PSV-5780
			PV-5224
			PSV-11613
			FI-8504
			LV-10172
			PSV-10639
			PSV-10619
Q_{DIB}	1.2	3 PSVs 2 Seal Pot 2 Pumps 1 NG Sweep Gas 1 Other	P-1551 A/B Dis.
			PSV-15600
			FI-15012
			P-1551 A/B
			PSV-15601
			PSV-15606
			E-1556
			P-1552 A/B Dis.
			P-1552 A/B
Q_{HCK2}	10.2	4 PSVs 1 Other	LV-10121
			PSV-10633
			PSV-10634
			PSV-10636
			PSV-10637

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
Q_{CRUDE}	10.2	18 PSVs 2 Seal Pots 2 Process Valves 2 Seal Pots 1 Drain 1 Refinery Sweep Gas 1 Nitrogen Sweep 1 Depressurization Vent	PSV-1715
			PSV-1716
			1-PV-8028
			P-102 A/B/C
			1-PSV-128
			1-PSV-1722
			PSV-1736
			PSV-1734
			Line
			1-PSV-11
			1-PSV-14
			PSV-1714
			P-132 A/B
			D-107 Vent
			1-PSV-6
			FI-1201
			FI-1984
			Crude N2
			PSV-1745
			PSV-2844
			PSV-2829
			7-PSV-90
			7-PSV-91
			D-704/705 Drain
			7-PSV-146
			7-PSV-156
			PSV-7620
			7-PICV-155A (Fuel Gas vent to flare)

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
Q_{DDU}	5.5	14 PSVs 3 Seal Pots 3 Drains 2 Depressurization Vents 1 NG Sweep Gas 1 Other	PSV-16002
			PSV-16003
			PSV-16013
			PSV-16076
			PSV-16278
			HV-16073
			V-1605 Drain
			V-1606 Drain
			PSV-16101
			PSV-16107
			C-1601A drains and recycle to flare
			PSV-16129
			PSV-16139
			PSV-16149
			PSV-16192
			P-1607 A/B
			P-1606 A/B
			HV-16340
			P-1605 A/B
			PSV-16367
			V-16078
			PSV-16303
			PSV-16396
			FI-16304
Q_{H2}	13.5	1 Process Valve 4 PSVs	PSV-10616
			PV-10003
			PSV-10601
			PSV-10602
			PSV-10635
			FI-10113

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
Q_{HCK1}	6.9	33 PSVs 5 Process Valves 5 Seal Pots 5 Depressurization Vents 5 Other 4 Samples 4 Drains 1 NG Sweep Gas 1 Manual Connection	V-401 Vent
			DMDS manual injection
			PSV-4008A
			PSV-4008B
			PSV-4803
			PSV-4804
			R-401 Sample Point
			R-402 Sample Pts
			FV-4079
			PSV-4058 A
			PSV-4058 B
			PSV-4068
			PSV-4806
			XDPV-4014/15
			LV-4016
			PSV-4025
			PSV-4081 B
			PV-4009
			PSV-4086 A
			PSV-4086 B
			PSV-4088 A
			PSV-4088 B
			PSV-4090 A
			PSV-4090 B
			Vents
			FV-4033
			PSV-4802
			P-405 A/B
			PSV-4385
			PSV-4801
			P-409 AN/BN
			PSV-4511
			PV-4106A
			P-434 A/B
			P-411 AN/BN
			PSV-4362
			PSV-4363
			C-401 Drain Bottom
			C-401 Drain Top
			C-402A 1st Stage

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
			C-402A 2nd and 3rd Stage
			C-402B 1st Stage
			C-402B 2nd and 3rd Stage
			P-403 A/B
			FI-4329
			PSV-4902
			PSV-4903
			PSV-4904
			PCV-4273
			PSV-4209
			T-512/T-514 Sample Points
			V-521 Drain
			V-409 Drain
			PSV-5003
			PSV-5700
			PSV-5701
			PV-5100
			T-502/T-511 Sample Points
			PSV-5702
			PSV-5703
			PV-5120
			PSV-5704
			PSV-5759

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
Q_{LPG}	10.2	9 PSVs 1 Hand Valve 2 Other	PSV-2830
			PSV-3701
			PSV-3703A
			PSV-3703B
			Float Trap
			V-304 A/B Vent
			PSV-3720
			PSV-3721
			PSV-3722
			PSV-3723
			PSV-7808
			LC-8402
Q_{MEGA}	1.8	2 PSVs 1 Process Valves 1 Pump 1 NG Sweep Gas 1 Sample 1 Other	PSV-18020
			E-1801 A/B/C
			PSV-18083
			PIC-18084
			Sample Station #1
			P-1805 A/B
			FI-18142

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
Q_{PRIP}	151.5	27 Other 8 PSVs 1 Seal Pot 1 Analyzer 1 NG Sweep Gas	PSV-12603
			PSV-12604
			AI-12031
			C-1201 A
			C-1201 B
			PSV-12607
			PSV-12608
			KV-12077
			KV-12080
			KV-12081
			KV-12082
			KV-12083
			KV-12086
			KV-12087
			KV-12088
			KV-12089
			KV-12090
			KV-12091
			PSV-12609
			PSV-12610
			PSV-12611
			KV-12094
			KV-12095
			KV-12096
			KV-12097
			KV-12098
			KV-12099
			KV-12102
			KV-12103
			KV-12104
			KV-12105
			KV-12106
			KV-12107
			KV-12108
			PSV-12612
			P-1202 A/B
			FI-12152

Flaring Process Unit Header	Flow (mscfd)	Sources	Detailed Source Description
Q_{REF1}	0.1	3 PSVs 2 Seal Pots 1 Process Valves 1 Other	PSV-7751
			PSV-7820
			V-201 Vent
			PSV-2702A
			P-203 A/B/C
			PV-2467
			P-206 A/B
Q_{SWS}	3.4	3 PSVs 1 NG Sweep Gas	FI-4330
			PSV-6010
			PSV-6100
			PSV-6104
Q_{REF2}	0	5 Drains 3 PSVs 1 Other	Drain
			Drain
			V-301 Drain
			X-706 Drain
			PSV-12621
			FV-12704A
			PCV-12733
			PSV-12622
			PSV-12623
Q_{VAC}	8.2	6 PSVs 2 Seal Pots 1 Drain 1 NG Sweep Gas	PSV-17402
			PSV-17417
			PSV-17418
			P-1705 A/B
			P-1706 A/B
			PSV-17419
			PSV-17430
			D-1705 Drain
			PSV-17423
			FI-17203
$Q_{BASELOAD}$	159.3		

Appendix C

Consent Decree Cross Reference Table

Table C - 1 Consent Decree Cross Reference Table

Citation	Consent Decree Requirement	Location
127(a)	A listing of all refinery Flaring Process Units, ancillary equipment, and Fuel Gas Systems connected to the Flare for each Covered Flare.	Section 3.0 Appendix B
127(b)	An assessment of whether discharges to Covered Flares from these Flaring Process Units, ancillary equipment and Fuel Gas Systems can be minimized or prevented during periods of Startup, Shutdown, or emergency releases. The Flare minimization assessment must (at a minimum) consider the items in Paragraphs 127.b.i-iii of the Consent Decree. The assessment must provide clear rationale in terms of costs (capital and annual operating), natural gas offset credits (if applicable), technical feasibility, secondary environmental impacts and safety considerations for the selected minimization alternative(s) or a statement, with justifications, that flow reduction could not be achieved. Based upon the assessment, Settling Defendants shall identify the minimization alternatives that they have implemented by the due date of the Flare Management Plan and shall include a schedule for the prompt implementation of any selected measures that cannot reasonably be completed as of that date.	Section 6.0 Section 7.0
127(b)(i)	Modification in Startup and Shutdown procedures to reduce the quantity of process gas discharge to the Flare.	Section 6.0
127(b)(ii)	Plan and schedule for conducting acoustic monitoring on all hydrocarbon PRVs directed to a Covered Flare that are not identified in Appendix C - 2.2, as required by Paragraph 116 of the Consent Decree.	Section 7.2
127(b)(iii)	Installation of a FGRS, or, for facilities that are Fuel Gas rich, a FGRS and a co-generation unit or combined heat and power unit.	Section 2.0 Section 6.0
127(c)	A description of each Covered Flare containing the following information:	Section 2.0
127(c)(i)	A general description of the Covered Flare, including whether it is a ground Flare or elevated (including height), the type of assist system (e.g., air, steam, pressure, nonassisted), whether the Flare is used on a routine basis or if it is only used during periods of Startup, Shutdown or emergency release, and whether the Flare is equipped with a FGRS.	Section 2.0
127(c)(ii)	The smokeless capacity of the Covered Flare based on design conditions. Note: a single value must be provided for the smokeless capacity of the Flare.	Section 2.0
127(c)(iii)	The maximum Vent Gas flow rate (hydraulic load capacity).	Section 2.0
127(c)(iv)	The maximum Supplemental Gas flow rate.	Section 2.0
127(c)(v)	For Covered Flares that receive Assist Steam, the Minimum Total Steam Rate and the maximum Total Steam rate.	Section 2.0
127(c)(vi)	For Covered Flares that receive Assist Air, an indication of whether the fan/blower is single speed, multi-fixed speed (e.g., high, medium, and low speeds), or variable speeds. For fans/blowers with fixed speeds, provide the estimated Assist Air flow rate at each fixed speed. For variable speeds, provide the design fan curve (e.g., air flow rate as a function of power input).	Section 2.0
127(c)(vii)	Simple process flow diagram showing the locations of the Covered Flare following components of the Flare: Flare tip	Appendix B
127(c)(vii)	Flare tip date installed, manufacturer, nominal and effective tip diameter	Section 2.0
127(c)(vii)	Flare tip drawing	Confidential - Available Onsite

Citation	Consent Decree Requirement	Location
127(c)(vii)	Simple process flow diagram showing the locations of the Covered Flare following components of the Flare: knockout or surge drum(s) or pot(s)	Appendix B
127(c)(vii)	Knockout or surge drum(s) or pot(s)' dimensions and design capacities	Section 2.0
127(c)(vii)	Simple process flow diagram showing the locations of the Covered Flare following components of the Flare: Flare header(s) and subheader(s)	Appendix B
127(c)(vii)	Simple process flow diagram showing the locations of the Covered Flare following components of the Flare: assist system	Appendix B
127(c)(vii)	Simple process flow diagram showing the locations of the Covered Flare following components of the Flare: ignition system.	Appendix B
127(d)	Description and simple process flow diagram showing all gas lines (including Waste Gas, Purge Gas or Sweep Gas (as applicable) Supplemental Gas) that are associated with the Covered Flare.	Appendix B
127(d)	For Purge, Sweep, and Supplemental Gas, identify the type of gas used. Designate which lines are exempt from composition or Net Heating Value monitoring and why (e.g., natural gas, gas streams that have been demonstrated to have consistent composition, Pilot Gas). Designate which lines are monitored and	Appendix B
127(d)	Identify on the process flow diagram the location and type of each monitor.	Appendix B
127(d)	Designate the pressure relief devices that are vented to the Flare.	Section 4.0
127(e)	For each flow rate, gas composition, Net Heating Value calorimeter or hydrogen concentration monitor identified in Paragraph 127.d of the Consent Decree, provide a detailed description of the manufacturer's specifications, including, but not limited to, make, model, type, range, precision, accuracy, calibration, maintenance and quality assurance procedures.	Section 2.0
127(f)	For each pressure relief valve vented to the Covered Flare identified in Paragraphs 127.d of the Consent Decree, provide a detailed description of each pressure release valve, including type of relief device (rupture disc, valve type) diameter of the relief valve, set pressure of the relief valve and listing of the Prevention Measures implemented. This information may be maintained in an electronic database on-site and does not need to be submitted as part of the Flare Management Plan unless requested to do so by EPA and the Applicable State Co-Plaintiff.	Section 4.0
127(g)	Procedures to minimize or eliminate discharges to the Flare during the planned Startup and Shutdown of the refinery Flaring Process Units and ancillary equipment that are connected to the Covered Flare, together with a schedule for the prompt implementation of any procedures that cannot reasonably be implemented as of the date of the submission of the Flare Management Plan.	Section 6.0
127(h)	Waste Gas Characterization and Mapping. Settling Defendants shall assess the Waste Gas being disposed of at each Covered Flare subject to this requirement as set forth in Appendix C - 2.1 and determine its characteristics as follows:	Appendix B

Citation	Consent Decree Requirement	Location
127(h)(i)	Volumetric (in scfd) Flow Rate. Settling Defendants shall identify the volumetric flow of Waste Gas, in scfm on a 30-day Rolling Average vented to each Covered Flare subject to this requirement as set forth in Appendix C - 2.1 between December 1, 2015, and November 30, 2016. To the extent that, for any particular Covered Flare, Settling Defendants have instrumentation capable of measuring the volumetric flow rate of hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide, and/or steam in the Waste Gas, Settling Defendants may break down the volumetric flow as between: (i) all Waste Gas flows excluding hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide, and/or water (steam); and (ii) hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide, and/or water (steam) flows in the Waste Gas. Settling Defendants may use either an engineering evaluation or measurements from monitoring or a combination to determine flow rate. In determining flow rate, flows during all periods (including but not limited to normal operations and periods of Startup, Shutdown, Malfunction, process upsets, relief valve leakages, power losses due to an interruptible power service agreement, and emergencies arising from events within the boundaries of each of the Covered Refineries), except those described in the next sentence, shall be included. Flows that could not be prevented through reasonable planning and are caused by a natural disaster, act of war or terrorism, or External Power Loss are the only flows that shall be excluded from the calculation of flow rate.	Section 5.1.1
127(h)(i)	Settling Defendants shall specifically describe the date, time, and nature of the event that results in the exclusion of any flows from the calculation.	Section 5.1.1
127(h)(ii)	Baseload Waste Gas Flow Rates. Settling Defendants shall utilize flow rate data to determine the Baseload Waste Gas Flow Rate, in scfd, to each Covered Flare subject to this requirement as set forth in Appendix C - 2.1. The Baseload Waste Gas Flow Rate shall not include flows during periods of Startup, Shutdown, and Malfunction. The Baseload Waste Gas Flow Rate shall be based on the period between December 1, 2015, and November 30, 2016.	Section 5.1.2
127(h)(iii)	Identification of Constituent Gases. For each Covered Flare subject to this requirement as set forth in Appendix C - 2.1, Settling Defendants shall use best efforts to identify the constituent gases within the Waste Gas and the typical range of constituent concentrations during baseload conditions. Settling Defendants may use either an engineering evaluation or measurements from monitoring or a combination to determine Waste Gas constituents.	Section 5.1.3
127(h)(iv)	Waste Gas Mapping. Using instrumentation, isotopic tracing, and/or engineering calculations, Settling Defendants shall identify and estimate the flow from each Flaring Process Unit Flare header to the main Flare header(s) for each Covered Flare subject to this requirement as set forth in Appendix C - 2.1. Using that information and all other available information, Settling Defendants shall complete an identification of each Waste Gas tie-in to the main Flare header(s) and Flaring Process Unit Flare header(s), as applicable, consistent with Appendix C - 1.11. Temporary connections to a Flare's header(s) and/or subheader(s) are not required to be included in the mapping.	Appendix B
127(i)	Taking a Covered Flare out of Service. Settling Defendants shall identify any Covered Flare that it intends to take out of service, including the date for completion of the decommissioning. Taking a Covered Flare "out of service" means physically removing piping in Flare header or physically isolating the piping with a welded blind so as to eliminate direct piping to the Covered Flare.	Section 9.0

Citation	Consent Decree Requirement	Location
127(j)	Prevention Measures. Settling Defendants shall describe and evaluate all Prevention Measures, including a schedule for the expeditious implementation and commencement of operation of all Prevention Measures, to address the following:	Section 6.0
127(j)(i)	Flaring that has occurred or may reasonably be expected to occur during planned maintenance activities, including Startup and Shutdown. The evaluation shall include a review of flaring that has occurred during these activities in the past three years and shall consider the feasibility of performing these activities without flaring.	Section 6.3
127(j)(ii)	Flaring that may reasonably be expected to occur due to issues of gas quantity and quality. The evaluation shall include an audit of the flare gas recovery capacity of each Covered Flare subject to this requirement as set forth in Appendix C - 2.1, the capacity including internal piping systems and the amine treating capacity available for Waste Gases including any limitations associated with the amine treating of Waste Gases for use as fuel. The evaluation shall consider the feasibility of reducing flaring through the recovery, treatment, and use of the Waste Gas.	Section 6.4
127(j)(iii)	Flaring caused by the recurrent failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. The evaluation shall consider the adequacy of existing maintenance schedules and protocols for such equipment. A failure is "recurrent" if it occurs more than twice during any five year period as a result of the same root cause.	Section 6.5
128	Updated Flare Management Plans. On the date specified in Appendix C - 2.1 and annually thereafter, Settling Defendants shall submit to EPA and the Applicable State Co- Plaintiff an Updated FMP, which shall update for the preceding calendar year, if and as necessary, the information required in Paragraphs 127.a-127.j and shall also include the following:	Appendix A
128(a)	Reductions Based on Root Cause Analysis. Settling Defendants shall review all of the Root Cause Analysis reports prepared pursuant to 40 C.F.R. Part 60, Subpart Ja or this Consent Decree to determine if reductions in addition to the reductions achieved through any corrective action can be realized; and	Section 8.0
128(b)	Revised Schedule. To the extent that Settling Defendants propose to extend any schedule set forth in the Initial FMP, Settling Defendants shall do so only with good cause.	Future FMP Update

Appendix D

Assist-Air Fan Curve

CHICAGO BLOWER CORPORATION

an ISO 9001 Company

1675 Glen Ellyn Road Glendale Heights, IL 60139

Description

June 1, 2015

Job Description:	**Tesoro, D47, B12, set 1, 18K, 8.**
Reference:	**Tesoro 60115 B12 curves**
Fan Type:	**Axial Fans**
Fan Model:	**Design 47 Vaneaxial A/4 Adjustable Pitch**
Fan Size:	**2700-B12-3500-SET:1.0**
Fan Width:	**100%**

Chicago Blower Corporation
Customer Service
Phone: (630) 858-2600
Fax: (630) 858-7172
e-mail: fans@chicagoblower.com

Performance

Values are in accordance with AMCA Standard 210

	Design	Net #1	Net #2	Net #3
Volume Flow Rate (ACFM)	18000	16740	14940	9000
Static Pressure (IN. WG)	8.5	7.4	5.9	2.13
Total Pressure (IN. WG)	9.78	8.51	6.78	2.45
Density (LB/FT³)	0.075	0.075	0.075	0.075
Temperature (°F)	70	70	70	70
Altitude (FT)	0	0	0	0
Speed (RPM)	3500	3258	2908	1751
Power Required (BHP)	56.5	45.6	32.4	7.1
Total Efficiency (%)	48.9	49.1	49.1	49
Outlet Velocity (FT/MIN)	4527	4210	3758	2264
Damper Opening (%)	N/A	N/A	N/A	N/A
Control Type	RPM Change			
Outlet Area (FT²)	3.98			

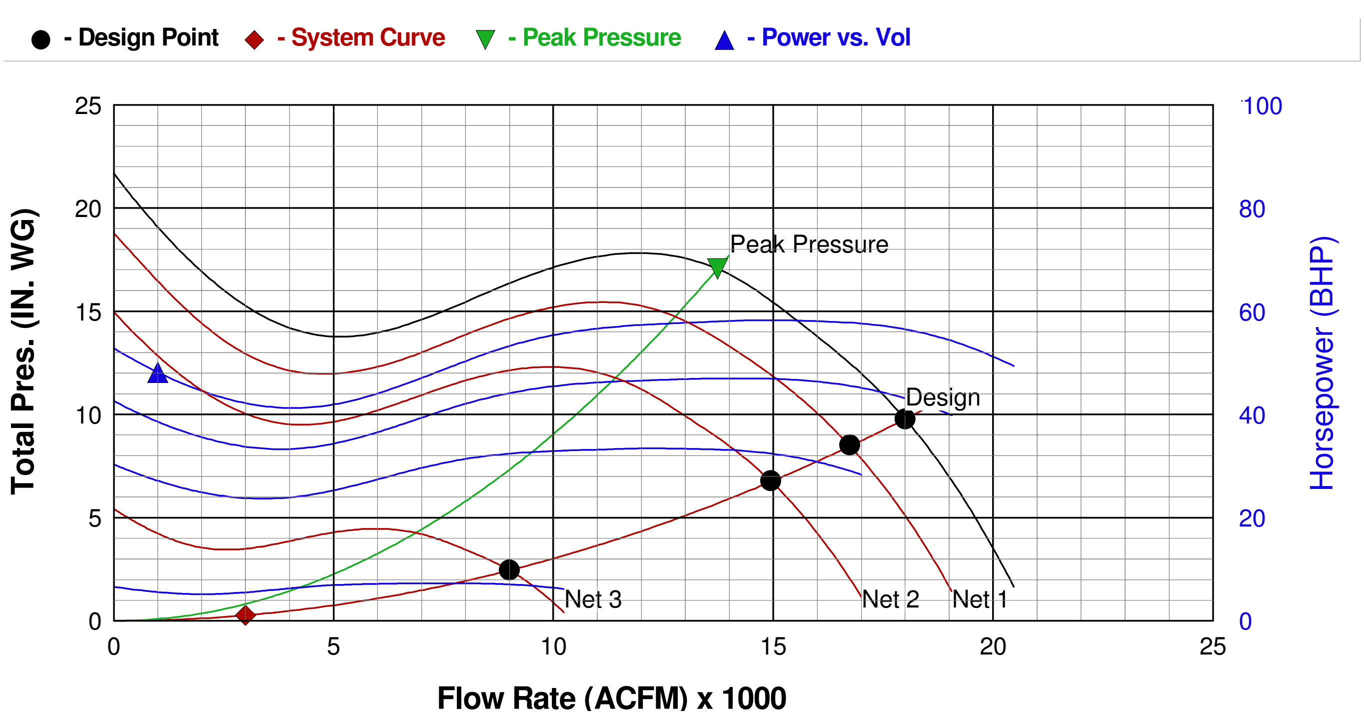
Sound

Values are in accordance with AMCA Standard 300

External Sound Power Levels (db)

Center Hz	63	125	250	500	1000	2000	4000	8000
Lwi Design	103	111	113	111	113	111	106	99
ERC	9	4	1					
Sound Pressure 3.0 FT from Fan (dBA)	110							

Lwi (Lwo) is sound power at the fan inlet (outlet)/airstream, less ERC.
Sound Pressure, Radiated, 3.0 FT from 0.105 housing 90 dBA.



CAUTION: FAN MUST NOT OPERATE LEFT OF PEAK PRESSURE CURVE, EXCEPT FOR START-UP

V21.5.61